

# MATERIAL SAFETY DATA SHEET

**SRM Supplier:** National Institute of Standards and Technology  
Standard Reference Materials Program  
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**SRM Number:** 3149  
**MSDS Number:** 3149  
**SRM Name:** Selenium Standard Solution  
**Date of Issue:** April, 1989  
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## SECTION I. MATERIAL IDENTIFICATION

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**Material Name:** Selenium Standard Solution

**Description:** SRM 3149 is a single element solution prepared gravimetrically to contain a nominal 10 mg/g of selenium with a nitric acid volume fraction of 10 %.

**Other Designations:** **Selenium in Nitric Acid** (aqua fortis; hydrogen nitrate; azotic acid; engraver's acid); **\*Selenic Acid** (selenic acid, hydrate; selenic acid monohydrate) in **Spectrometric Solution**

Name	Chemical Formulas	CAS Registration Numbers
Nitric Acid	HNO <sub>3</sub>	7697-37-2
Selenic Acid	H <sub>2</sub> SeO <sub>4</sub>	7783-08-6
Selenium	Se	7782-49-2

**DOT Classification:** Nitric Acid, Solution, UN2031

**Manufacturer/Supplier:** Available from a number of suppliers

\* The addition of selenium to nitric acid, along with other intermediate chemical reactions, forms selenic acid which will precipitate upon evaporation or drying of the solution.

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## SECTION II. HAZARDOUS INGREDIENTS

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Hazardous Components	Nominal Concentration (%)	Exposure Limits and Toxicity Data
Nitric Acid	10	ACGIH TLV-TWA: 2 mg/kg or 5 mg/m <sup>3</sup>
		OSHA TLV-TWA: 2 mg/kg or 5 mg/m <sup>3</sup>
		Human, Oral: LD <sub>50</sub> : 430 mg/kg
Selenic Acid	1.8	ACGIH TLV-TWA: 0.2 mg/m <sup>3</sup>
		OSHA TLV-TWA: 0.2 mg/m <sup>3</sup>
Selenium	1	ACGIH TLV-TWA: 0.2 mg/m <sup>3</sup>
		OSHA TLV-TWA: 0.2 mg/m <sup>3</sup>
		Rat, Oral: LD <sub>50</sub> : 6700 mg/kg



**Hazardous Decomposition or Byproducts:** Hazardous decomposition of nitric acid can produce various nitrogen oxides, including nitric oxide (NO), nitrogen dioxide (NO<sub>2</sub>), nitrous oxide (N<sub>2</sub>O), as well as nitric acid mist or vapor. Thermal decomposition of selenic acid will produce oxides of selenium.

**Hazardous Polymerization:**        \_\_\_\_\_ Will Occur          X   Will Not Occur

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**SECTION VI. HEALTH HAZARD DATA**

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**Route of Entry:**          X   Inhalation          X   Skin          X   Ingestion

**Health Hazards (Acute and Chronic): Nitric Acid:** Nitric acid may be fatal if inhaled, swallowed, or absorbed through skin. This material causes burns and is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin. Inhalation may be fatal as a result of spasm, inflammation, and edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting.

**Selenic Acid:** Inhalation may cause irritation of the nose and throat followed by headache and tightness in the chest. Other symptoms may include metallic taste, dyspnea, chills, nausea, bronchitis, or pneumonitis. At high levels, delayed pulmonary edema and convulsions may occur. Skin contact may cause severe irritation and burns with redness, pain, and blisters. Repeated or prolonged contact may cause dermatitis. Direct contact with the eye may cause redness, pain, blurred vision, and tearing. Corneal injury and burns are possible. Ingestion may cause metallic taste, burning pain in the throat and abdomen, followed by vomiting and severe irritation and disturbances of the gastrointestinal tract and a metallic taste in the mouth. Based on results of animal experimentation, degenerative changes of the liver, kidney, spleen, and heart as well as progressive anemia are possible. Chronic exposure may cause a garlic odor of the breath and sweat.

**Selenium:** Inhalation may cause irritation of the upper respiratory tract with sneezing and coughing. A brief exposure to high concentrations of fumes produced severe irritation of the nose and throat followed by headache in exposed worker. Skin contact may cause irritation or dermatitis. High concentrations of fumes may cause severe eye irritation or conjunctivitis. While selenium compounds are poorly absorbed from the gastrointestinal tract, ingestion may cause severe irritation and disturbances of the gastrointestinal tract and a metallic taste in the mouth. Other symptoms of exposure seen in animal studies may include anemia, liver, kidney, and heart damage, sterility, and congenital defects.

**Medical Conditions Generally Aggravated by Exposure:** Nitric acid may aggravate eye disorders, respiratory disorders, skin disorders, and allergies. Selenium may aggravate gastrointestinal disorders, immune system disorders, kidney disorders, liver disorders, respiratory disorders, skin disorders, and allergies.

**Listed as a Carcinogen/Potential Carcinogen:**

	Yes	No
In the National Toxicology Program (NTP) Report on Carcinogens	_____	<u>  X  </u>
In the International Agency for Research on Cancer (IARC) Monographs	_____	<u>  X  </u>
By the Occupational Safety and Health Administration (OSHA)	_____	<u>  X  </u>

**EMERGENCY AND FIRST AID PROCEDURES :**

**Skin Contact:** Remove contaminated shoes and clothing. Rinse affected area with large amounts of water followed by washing the area with soap and water. Watch for chemical irritations and treat them accordingly. Obtain medical assistance if necessary.

**Eye Contact:** Immediately flush eyes, including under the eyelids, with copious amounts of water for at least 15 min. Obtain medical assistance if necessary.

**Inhalation:** If inhaled, move the victim to fresh air. If breathing is difficult, give oxygen; if the victim is not breathing, give artificial respiration. Obtain medical assistance if necessary.

**Ingestion:** If ingestion occurs, wash out mouth with water. **DO NOT** induce vomiting. Obtain medical assistance if necessary.

**NOTE:** Wash affected skin areas with 5 % solution of sodium bicarbonate ( $\text{NaHCO}_3$ ). If ingested, the risk versus the benefit of the passage of a naso-gastric tube is debatable. Activated charcoal is of no value. **DO NOT** give the exposed person bicarbonate to neutralize the material.

**TARGET ORGAN(S) OF ATTACK:**      **Nitric Acid:** Skin, teeth, eyes, and upper respiratory tract  
                                                 **Selenium and Selenic Acid:** Liver, kidneys, and upper respiratory tract

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## SECTION VII. PRECAUTIONS FOR SAFE HANDLING AND USE

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**Steps to be Taken in Case Material Is Released or Spilled:** Notify safety personnel of spills. Surfaces contaminated with spills should be covered with soda ash or sodium bicarbonate to neutralize the acid. Place the neutralized material into containers suitable for eventual disposal, reclamation, or destruction.

**Waste Disposal:** Follow all federal, state, and local laws governing disposal.

**Handling and Storage:** Provide general and local explosion proof ventilation systems to maintain airborne concentrations below the TLV. Provide approved respiratory apparatus for nonroutine or emergency use. Use an approved filter and vapor respirator when the vapor or mist concentrations are high. Wear gloves and chemical safety glasses where contact with the liquid or high vapor concentrations may occur. An eye wash station and washing facilities should be readily available near handling and use areas. Wash exposed skin areas several times a day with soap and warm water.

**NOTE:** Contact lenses pose a special problem; soft lenses may absorb irritants and all lenses concentrate them. **DO NOT** wear contact lenses in the laboratory.

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## SECTION VIII. SOURCE DATA/OTHER COMMENTS

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**Sources:** MDL Information Systems, Inc., MSDS *Selenium*, June 2, 1999.  
MDL Information Systems, Inc., MSDS *Selenic Acid*, December 8, 1998.  
MDL Information Systems, Inc., MSDS *Nitric Acid*, June 2, 1999.  
The Merck Index, 11th Ed., 1989.  
The Sigma-Aldrich Library of Chemical Safety Data, Ed. II, 1988.

**Disclaimer:** Physical and chemical data contained in this MSDS are provided only for use in assessing the hazardous nature of the material. The MSDS was prepared carefully, using current references; however, NIST does not certify the data on the MSDS. The certified value for this material is given on the NIST Certificate of Analysis.